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510,017
01 OCT 2004
PCT/EP2003/003496



PCT

10/510017

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference J50002PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP2003/003496	International filing date (day/month/year) 03 April 2003 (03.04.2003)	Priority date (day/month/year) 03 April 2002 (03.04.2002)
International Patent Classification (IPC) or national classification and IPC G01N 21/55, 21/35		
Applicant JOHANN WOLFGANG GOETHE-UNIVERSITÄT FRANKFURT AM MAIN		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 9 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 31 October 2003 (31.10.2003)	Date of completion of this report 26 October 2004 (26.10.2004)
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

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International application No.

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I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
pages _____ 1-29 _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☒ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement under Article 19
pages _____, filed with the demand
pages _____ 1-30 _____, filed with the letter of 06 October 2004 (06.10.2004)
- ☒ the drawings:
pages _____ 1/4-4/4 _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

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III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 29, 30

because:

☐ the said international application, or the said claims Nos. _____
relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. _____
are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. _____ are so inadequately supported
by the description that no meaningful opinion could be formed.

☒ no international search report has been established for said claims Nos. 29, 30

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

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Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: BOXES I, III and VIII

BOX I

Basis of the report

1. Amended set of claims

The amendments submitted with the letter of 6 October 2004 introduce substantive matter which goes beyond the original disclosure in the international application as filed, thereby contravening PCT Article 34(2)(b). This concerns the following amendments:

1.1 Claim 1:

line 4: the wording "and/or" has been added. The "infrared measurement device comprising...or at least one measurement unit" is not admissible because in the originally submitted application the measurement unit appeared to be necessary for the definition of the invention.

The statement with regard to novelty and inventive step takes into consideration only the wording with "and".

BOX III

Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

Claims 29 and 30 have not been searched.

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Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: BOXES I, III and VIII

BOX VIII

Certain observations on the international application

1. PCT Article 6

- 1.1 According to the applicant's letter of 6 October 2004 (see paragraph IV), the concept common to claims 1 and 23, respectively, and 26, is that the combination of measurement unit and quantum cascade laser permits the device to be miniaturised.

However, independent claims 23 and 26 do not contain this feature; see the last line of the claims, in which "a beam from the quantum cascade laser can be coupled". The feature is therefore not a necessary feature. This does not comply with the requirement of PCT Article 6 in conjunction with PCT Rule 6.3(b) that each independent claim must contain all the technical features that are necessary for the definition of the invention.

- 1.2 Although claims 1, 23 and 26 were drafted as separate independent claims they appear to relate to the same subject matter (measurement unit comprising an ATR body and a quantum cascade laser) and differ only by the use of such a device, in an outflow duct (e.g. claims 23, 26) for analysis in urine and/or faeces.

For this reason, the claims are not concise and do not meet the requirements of PCT Article 6.

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(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: BOXES I, III and VIII

1.3 Claim 12

line 4: the measurement cell renders the claim unclear and should be replaced by a measurement unit (such as that in line 3).

1.4 Claim 17

Regarding the use of the term "approximately", see the PCT Guidelines, CIII, 4.5a.

2. Claim 25

The features of the ATR body are already included in claim 23 (lines 7-8), and for this reason claim 25 is superfluous.

3. Claim 28

The features of the ATR body are already included in claim 26 (lines 7-8), and for this reason claim 28 is superfluous.

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V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-28	YES
	Claims		NO
Inventive step (IS)	Claims	1-22, 24, 27	YES
	Claims	23, 25, 26, 28	NO
Industrial applicability (IA)	Claims	1-28	YES
	Claims		NO

2. Citations and explanations

1. Citations

This report makes reference to the following documents cited in the search report:

- D1: EP-A-0 884 584 (LAB OF MOLECULAR BIOPHOTONICS), 16 December 1998 (1998-12-16)
D2: US-A-5 434 411 (MIYAHARA YUJI ET AL), 18 July 1995 (1995-07-18)

2. Novelty and inventive step (PCT Article 33(2) and 33(3))

2.1 Independent claim 1

The present application meets the requirements of PCT Article 33(1) because the subject matter of claim 1 is novel (PCT Article 33(2)) and involves an inventive step (PCT Article 33(3)).

Document D1, which is considered to represent the closest prior art, discloses in figure 1:

an infrared measurement device comprising an

analysis unit, a detector and a measurement unit with an ATR body (28) and an infrared light source (3), the measurement unit comprising at least one ATR body (28) with at least two plane, substantially parallel interfaces (see D1, figure 1) which are transparent or partially transparent to the measurement radiation and which show a refraction index higher than that of a medium to be assayed adjacent to at least one interface; the weakened infrared measurement radiation can be totally reflected by at least one of the plane, parallel interfaces of the ATR body (28).

The device as per claim 1 differs from the device known from D1 in that

- i) the infrared light source comprises one or more quantum cascade lasers or a radiation source that emits a multiple wavelength spectrum; the radiation from the radiation source interacting with a sample system can be received in or on the measurement unit, and the interferogram recorded by the detector can be analysed in the analysis unit by Fourier transformation.

Claim 1 is thus novel over D1.

The technical effect of feature i) is that the measurement unit consists of an ATR body and of a quantum cascade laser, in that the radiation source interacts with a receivable sample system and in that even the smallest sample quantities can be detected continuously.

The fact that the claimed infrared measurement device, in particular the combination used of measurement unit and quantum cascade laser, is extremely insensitive to vibrations has also proven to be advantageous.

The present invention addressed the problem of developing a device which can be used without problem for the on-line control of aqueous and non-aqueous systems, for example in a discharge duct.

According to the invention, the choice of a measurement unit comprising an infrared light source in the form of a quantum cascade laser, in combination with an ATR body, makes it possible to miniaturise the device.

None of the documents cited in the search report discloses or suggests this application of a device of this type.

D2 discloses an infrared measurement device and shows in figure 7 the use of a throughflow cell in combination with infrared radiation. D2 does not disclose feature i). The use of quantum cascade lasers, which permits radiation of different frequencies and/or intensities in a particular time sequence through the ATR body, is also not mentioned.

Finally, it is pointed out that feature i) permits a plurality of components in a sample to be qualitatively and quantitatively measured practically simultaneously, like in the invention.

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The device as per claim 1 can therefore be
considered inventive.